Memo. of Grand Lake Coal Field,

IN THE COUNTIES OF QUEENS AND SUNBURY, NEW BRUNSWICK.

BY

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ASSISTANT COMMISSIONER OF MINES AND CHIEF INSPECTOR OF MINES. NOVA SCOTIA.

THIS Coal Field is referred by the officers of the Canadian Geological Survey to the true or productive Coal measures, which at this point are presented in a comparatively thin horizon. The part of the district more particularly referred to here, lies on the north shore of the Grand Lake, and extends from Little River nearly to Chipman on the Salmon River, a distance of about fifteen miles. The district may be described as an even surface gradually rising to a maximum height of about 275 feet, at a distance of about six miles from the shore of the lake, and varied by gentle valleys.

The dip of the measures agrees closely with that of the surface of the rock, and at several points certainly, and probably in all cases follows the gradual rises and inclinations of the rock

surface. In other words, the measures are presented in a series of very gentle undulations, having the brooks in the bottom of each synclinal. The general dip is very flat, almost level.

The importance of this is evident. The Coal appears to follow the inclinations of the ground, which has everywhere a gradual rise or fall, and the cover varies from a few feet of clay or gravel to about 40 feet of rock and surface soil. This structure presents the Coal bearing strata as uniform at all points, and exposed wherever the streams have eroded below its horizon.

On the accompanying map the exploratory work has shown these outcrops as proved by pits, mines, etc. This is particularly shown from Flowers' Cove to the Newcastle River, and along its banks and three of its tributaries.

These exposures and the universal horizontal position of the strata have permitted the demonstration of the Coal values of the property in question in an unusual and satisfactory manner, and the warrant of its continuation over considerable areas of ground not yet minutely examined.

I am informed that the accompanying map shows territory at present controlled by Mr. Leckie. Mr. Leckie states that he has recently completed the purchase of 2,500 acres of freehold, making in all six square miles of freehold not paying royalty, and 34 square miles of land leased from the Government subject to a royalty, I believe, of ten cents a ton.

There appears to be only one seam of coal, varying, where worked, from 22 to 30 inches in thickness. I visited outcrops at Flowers' Cove, Newcastle River, New Zion, Partridge Brook, Fulton's, etc., and found the seam to present the same general characteristics. I did not visit the property lying to the east of the Newcastle River, and am unable to give any details about it, but understand that the coal occurs as described in accompanying memo., and is worked at several points.

Wherever the seam is cut by the brooks it can be followed to an indefinite distance with natural drainage and a slight cover. Wherever the brooks, which have a very gradual fall, have worn the strata away nearly to the coal bed, there are areas in which the Coal is covered only by a layer of soft decomposed shale and the ordinary soil. At several points this covering varies from four to ten feet over considerable areas. Some attention has been paid during the past season to testing these strippings. They are marked in dark colors on the map. The stripping ground on Partridge Brook, so far as tested, covers about 125 acres. Others are shown at New Zion, Higgins, Fulton, etc. It is probable that other deposits will be found on the upper waters of the numerous brooks intersecting the areas.

These deposits can be readily worked by steam shovels, and from the openings thus made drainage levels can be run in all directions in connection with the extraction of the Coal where covered by rock.

QUANTITY OF COAL.

The time at my disposal did not permit of exact calculations on this point. There would be in the stripping ground, so far as they have been tested, at least 1,000,000 tons of Coal, and I have no doubt the extent of this ground will prove much greater upon further exploration. The district lying west of the Newcastle River should, allowing for the comparatively small area of unproductive ground, and estimating the seam at an average thickness of two feet, contain about 50,000,000 of tons of Coal.

QUALITY OF COAL.

The Coal, although near the surface, is bright and compact, and is soft only for a few yards from the outcrops. On the stripping ground the layer of soft shale over the Coal appears to have kept it in good condition.

From the analyses shown me the Coal holds from 27 to 37 per cent. of volatile matter, from 52 to 66 per cent. of fixed carbon, from 1.50 to 5 per cent. of sulphur, and from 1.8 to 10 per cent. of ash. Great part of the sulphur can be separated from the Coal by hand picking, and I am informed that both ash and sulphur can be readily removed from the slack by washing, so as to bring it within the composition of a good coking Coal, and I should judge this to be the case.

The variations in composition are not unusual in Coals taken from widely separated points in the same seam.

In comparison with Cape Breton Coals I give the following average of the analyses appended, side by side with the average of the analyses of Cape Breton Coals, as given by the Geological Survey of Canada. [The results of the survey analyses were confirmed by a complete set of analyses of Cape Breton Coals, made some years ago by me, and published in the transactions of the North of England Mining Institute.]:

	Grand Lake.	*Cape Breton.*
Volatile matter	35.17	33.44
Fixed carbon	56.87	61.87
Ash	5.85	4.22
Sulphur	2.71	2.37

The quality of the Coal is superior to what I had anticipated it would be.

The Coal at present is shipped as it comes from the pick; it is not freed from any roof stone that may get mixed with it. Any stone or pryites in the coal is not picked out. The Coal is not screened; it is hauled by carts to the loading place, dumped on the ground, and loaded by wheelbarrows—yet it is in its rough state a good smith Coal, cokes readily, burns with a good flame, and comparatively little smoke. When properly cleaned and handled it should furnish a good quality of Coal, comparing well with other maritime Coals.

COST OF MINING.

At present the Coal is mined to the extent of about 6,000 tons a year, by the farmers living over it.

The price paid per ton of 2,240 lbs., delivered at bank from levels, driven in the hill sides, is 70 cents. No systematic mining is attempted, and the cost could be reduced. The cost of the Coal in the stripping ground would be much less.

TRANSPORT.

At present about 60 to 70 cents is paid for hauling the Coal to the landing places, and an additional charge of fifteen cents for loading, usually by wheelbarrows. The Coal is carried by small schooners of 30 to 60 tons capacity, to St. John and Fredericton, about 80 miles, for about 75 cents per ton. These charges could be materially reduced by a system of barge towage, for which the water-ways are particularly adapted. A tramway five miles long would command a large section of the western end of the district, and could be cheaply constructed, so that the land transport and loading referred to could be reduced to say twenty cents a ton.

Flowers' Cove and Newcastle landing have about ten feet of water at the wharves. The outlet by water is available for about seven months of the year. The New Brunswick Central

Railway touches the extreme east end of this property at Chipman, and uses Grand Lake Coal. The construction of a railway of 25 miles from Newcastle to Fredericton, over a level country, would give an important outlet, and at this point would connect with the Canada Eastern, Canadian Pacific, Maine Central, and other Railways, and furnish fuel at a cheap price for these roads—having a haulage of about 25 miles to Fredericton, as against fully 200 miles from the nearest Nova Scotia collieries.

I have not gone closely into the details of cost of opening and operating this district, but in my opinion, it can be readily developed at a cheap cost to produce Coal which can be laid down at St. John and Fredericton at prices a long way below any Coals now selling at these points.

I beg to submit sketch map, showing locations of railways referred to in connection with the Grand Lake Coal fields, map of part of the property, copy of memo. of Mr. R. G. Edwards Leckie, sections and sheet of analyses, details of markets, etc., and memo. of cost of mining furnished by Mr. Leckie.

I trust my notes and the papers submitted will serve to convey a good general idea of the district, and I will be pleased to furnish any further information desired.

HALIFAX, N. S., November 22nd, 1894.

Flowers' Cove and Newcastle landing have about ten feet of water at the wharves. The outlet by water is available for about seven months of the year. The New Brunswick Central

REPORT ON PROPERTY

OF

Colonial Iron & Coal Company, Grand Lake, N. B.

By R. G. EDWARDS LECKIE, C. E., M. E., Member of American Institute of Mining Engineers.

Situation.—The property is situated in the Newcastle Coal-field, Queens County, to the north of Grand Lake, New Brunswick, and extends from the Newcastle River on the east to Little River on the west, and from a point one and one-halt miles from the lake shore northerly to a distance of ten miles, comprising the greater part of the developed coal field.

Extent.—The total area consists of forty square miles, 2,500 acres of which is freehold property, and not subject to royalty. The remainder is held by lease from the government of New Brunswick.

Conformation of Strata.—The strata in this district lies almost flat, rising gently from the lake shore inland in a north-westerly direction. The undulations are gentle and in no case abrupt, the surface in most cases conforming to the folds of the strata.

The coal seam underlies the property at a very moderate depth, and large areas exist in which the coal is merely covered by a few feet of surface soil.

"Surface Seam."—The main or "Surface Seam," as it is called, is generally accompanied by a smaller seam from six to eight inches in thickness, which occurs either above or below it in different localities, and is separated from the larger seam by a few inches of fire clay. The surface seam consists of very clean Coal of an average thickness of two feet; but varying in places from eighteen inches to three feet.

Analysis.—The following analysis show the quality of the Coal in both the smaller and larger seams.

(See separate Analysis Sheet.)

Sections.—Sections showing the occurrence of the Coal in the various points where the strata have been cut were taken.

(See separate Section Sheets.)

Trial Pits, Borings, etc.—During the past summer the property has been tested in various places by means of trial pits and borings, proving the continuity of the bed, as well as exposing the most advantageous localities for immediate operations.

Block 1. (*See Plan.*)—But two pits were sunk and good Coal found at the depth of four and five feet below the surface, respectively. The appearance of the ground would indicate that there is an extensive stripping territory in this vicinity. Seam average thickness.

The coal seam underlies the property at a very moderate depth, and large areas exist in which the coal is merely covered by a few feet of surface soil.

Block 2.—Numerous trial pits and borings prove an area of at least 50 acres where the average depth of surface overlying the Coal would not exceed ten feet. Coal in most places compact and of average thickness.

Block 3.—No tests were made in this Block; but the Coal undoubtedly underlies this area, probably at a depth too great for stripping.

Block 4.—No tests made in this Block; but outcrops found on the river would indicate that Coal underlies this area as well as Block 3.

Block 5.—Coal appears here on the banks of No. 18 Brook on the Graham Lot, now owned by this Company. The stream has cut through the bed, exposing the Coal on either bank.

Block 6.—The bed of Coal has been eroded along the courses of No. 18 and No. 6 Brooks, lumps of Coal having been found in the beds of the stream. Coal has been found in the south-east portion of this block.

Block 7.—The head of a level driven from the Fulton Mine almost reaches into this block, showing that the Coal certainly underlies this area. In all probability considerable stripping facilities will be found along the Gilchrist Brook, which flows through the middle of this block.

Block 8.—Numerous trial pits have developed stripping ground of 125 acres in the centre of this area, in which the Coal lies at an average depth of less than ten feet. Coal compact; seam average thickness.

Block 9.—Old workings and recent trial pits have proved nearly all of the separate areas in this block to be underlaid by the Coal. A stripping area of about 75 acres occurs on the Higgins Lot, so called, and a similar area of 25 acres on the R. Yeamans Lot, so called. Both lots now owned by the Company. The Coal underlying the remainder is probably too deep for stripping.

Block 10.—In the eastern portion Coal has been found by boring at a depth of 25 feet.

Block 11.—Coal has been found here in the bank of the Newcastle River, and the surface being higher towards the interior of this block, the Coal undoubtedly extends under it at an increasing depth.

Continuity of Coal Bed.—These various trials serve to prove that the Coal underlies continuously all of the above areas, and being eroded only in the localities where the streams cut through the bed.

Extent of Coal Proved.—Operations this season have already proved an extent of 500 acres of Coal, which can be won simply by stripping the overlying alluvial. Taking

3,000 tons to the acre, this would make 1,500,000 tons of Coal immediately available. Of the other 34 square miles, assuming 12 per cent. to be waste, then there remain 30 square miles, containing 57,000,000 tons of Coal.

Drainage of Workings.—An important and valuable feature of this coal field is that from the position of the Coal seam it has a natural drainage by means of the streams which traverse it, cutting through the strata at a lower depth than the Coal.

Depth of Coal below Surface.—The greatest depth at which Coal has been found at any point of the coal field is 45 feet, and it is not probable that at any spot it lies at a greater depth than 60 feet below the surface.

Coal Easily Got At.—This fact, therefore, enables the Coal to be mined at any point by sinking of shafts, comparatively inexpensive and requiring no heavy machinery, but rather that of a portable nature, which could be moved from place to place as the Coal became worked out.

Cost of Stripping.—Steam shovels could be advantageonsly employed in stripping the surface Coal. The average cost of Coal on cars by this means would not exceed 45 cents per ton.

Present Cost of Regular Mining.—Where the Coal is mined underground the present cost is $1.20 per chaldron, including timbering, track-laying, and all expenses. This is equal to 80 cents per ton of run of mine Coal delivered upon the cars at mouth of adit level or slope.

Long Wall System.—The facilities for attacking the Coal at various points by inexpensive openings, offers the greatest facilities for laying out pits for long wall working; the most economical method of mining both as regards labor and complete extraction of Coal.

Removal of Soil in Stripping.—It may also be noted in regard to the stripping, that the soil removed from above the Coal has merely to be transferred into the excavation on the other side of track caused by previous extraction of coal.

Shipping Facilities.—The facilities for shipment are excellent. The Coal seam is exposed on the lake shore, where barges drawing ten feet of water can load in safety at all times during the season of navigation. The distance to St. John via the St. John River is 80 miles, and to Fredericton up river about the same.

Cost in St. John.—Transportation by barges carrying about 400 tons each will not exceed fifteen cents per ton, so that run of mine Coal delivered in St. John from stripping ground will cost 70 cents, and that from underground mining $1.10.

FREIGHTS.

St. John and neighborhood are at present supplied with bituminous coal from Springhill and Joggins Collieries, the distance by rail being: Joggins, 157 miles, and Springhill, 159 miles.

The distance from Grand Lake Coal Field to St. John, via Canadian Pacific Railway from Fredericton, is 90 miles, and via New Brunswick Central to Norton, thence Intercolonial Railway to St. John, 92 miles.

By water the distance from Joggins to St. John is about 80 miles, and from Springhill, via Parrsboro, about same distance, exclusive of 28 miles haul by rail from Springhill to Parrsboro. This navigation is in the Bay of Fundy and requires heavy sea-going vessels to contend successfully with its strong tides and heavy storms. On the other hand, the 80 miles from Grand Lake Collieries to St. John is river navigation, requiring only barges of comparatively light build like those on the Ohio River, which cost about $1,200, and carry from 400 to 500 tons each, and lasting about ten years. The average freight from Joggins and Parrsboro is 80c. per ton of 2240 lbs., and from Grand Lake, 20c.

By Canadian Pacific Railway the distance from Grand Lake to Montreal is 482 miles. From Joggins to Montreal, via Intercolonial Railway and Grand Trunk, the distance is 733 miles, and from Springhill, via same route, 735 miles.

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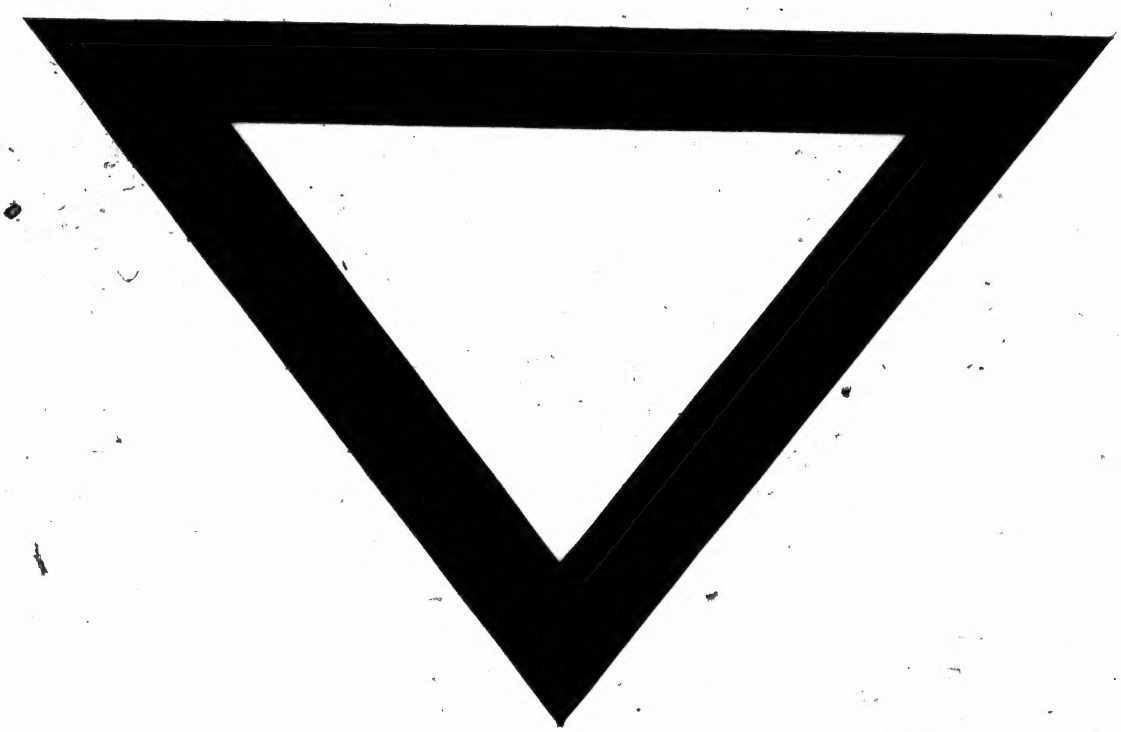
Consumers of Coal who can be supplied at least cost of freight from Grand Lake:—

	TONS.	TONS.
St. John, N. B.—		
For domestic purposes	30,000	
For manufacturing purposes and users of steam power	60,000	
For steamers, tugs, etc	15,000	105,000
Fredericton, Woodstock, etc., for domestic and manufacturing purposes		20,000
Digby, Annapolis, Yarmouth, etc		20,000
Sherbrooke, Capelton, Magog, Farnham, and Eastern Townships; haul 300 miles shorter than from Springhill via I. C. R. and G. T. R		20,000
Railways—		
Canadian Pacific and connections	100,000	
Canada Eastern, Lake Temiscouata, etc	15,000	
Intercolonial Railway, St. John District	20,000	
Do. Northern District, to be reached via Canada Eastern Ry	40,000	
Maine Central at Vanceboro; only 68 miles haul	25,000	200,000
		365,000
Coal for coke-making, St. John	100,000	
Coal for Briquettes and Coke to be made in New England ports	100,000	200,000
		565,000